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The Present Day Problem in Tuberculosis*

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The "Captain of Men of Death" is not Mars. Injury, mutilation and destruction in war has not been the first and single greatest cause of death among humans. While war takes an immense toll of lives in the course of its many battles, this toll of lives has never equalled in the long annals of history the record toll of one disease, Tuberculosis, and to Tuberculosis the appellation "Captain of Men of Death," as yet, applies throughout the world. The present estimate as to the total population of the world is 2,200,000,000. While only an approximate estimate can be made of the tuberculosis mortality throughout the world because statistical data are not available from great areas with immense populations such as China, India and even Russia; figures, however, have been obtainable from most of Europe and America. Taking our knowledge of group studies in death rates, one can conservatively apply an average present mortality in tuberculosis of 90 per 100,000 population. This would indicate that at this time there are approximately 2,000,000 deaths annually from this cause alone. If we look further and see the picture on the basis of an entire lifetime, one realizes

that at least 8 per cent at a minimum of all deaths are due to tuberculosis. Therefore, among those alive in the world at this time, it is entirely likely that anywhere from 175,000,000 to 200,000,000 will perish from the inroads of tubercle bacilli.

But war and the consequences of war have always caused an increase in the morbidity and the mortality from phthisis.

During World War Number I, the definite downtrend in tuberculosis mortality in the European countries was immediately halted. This was attributed to a marked congestion in urban centers, physical and nervous fatigue, inadequate housing and a depletion of food reserves. Intimacy of contact allowed for greater infection dissemination; and failure of constitutional resistance allowed increased disease development.

Mortalities doubled and trebled in various European cities, but these high rates again resumed the normal trend with the resumption of normal industry and living conditions. In the present war, the only comparative statistics for the past three years are these from England, Wales and Scotland, where an increase of more than 15 per cent in tuberculosis mortality is noted for 1941 over 1939.

In London, the increase is more marked. There in 1939 the rate was reported at 78 and in 1940 at 97 per 100,000 population. In

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Glasgow the deaths numbered 972 in 1939; 1177 in 1940, and in 1941 they were estimated to reach 1342.

In France, reports from some of the larger centers indicate an increase in tuberculosis mortality in the first six months of 1941 over 1939 of approximately 30 per cent.

Studying the tuberculosis trends in this country, at the turn of this century the death rate was over 200 per 100,000. In the past year, 1941, it had decreased to an all-time low of under 45.

In comparison, we should not forget that there are other countries where tuberculosis death rates continue to range between two hundred and five hundred per one hundred thousand at this time. We must also remember that only two decades ago, the age group of 21 years and over showed evidence of tuberculous infection in at least 95 per cent of the inhabitants of this country, as determined by tuberculin sensitization tests, and that today only about 50 per cent of this same age group evidence such infection.

The victims of tuberculosis are found in greatest numbers between the ages of 15 and 35, in which age groups this disease still is the first cause of death in these United States. Under the present emergency where it is of paramount importance to maintain health and vigor for physical and mental efficiency on the combat line or in the increased needs of production in industry, more careful attention must be given to the control and continued eradication of this killer.

If we were to list the most important factors in the achievement of the low mortality attained in this country, we would have to present the following three considerations:

- 1) The detection of the tuberculous individual, having a positive sputum and controlling that individual, or the disease which he has, so that he is not capable of further infection spread.

- 2) The building and development of many institutions where such individuals might be housed and treated to prevent infection spread.

- 3) The work of the veterinarian in eradicating tuberculosis in cattle has resulted in the fact that less than one-half of one per cent of cattle housed for dairy purposes in this country show evidence of tuberculosis. Thus, the almost complete absence of tubercle

bacilli in this important article of food has resulted in nearly a complete disappearance of the nonpulmonary forms of this disease.

We should also appreciate the improvement noted in the constitutional resistance of individuals in this country, which has resulted from the following factors:

- 1) An improved knowledge of dietetic habits, particularly as they refer to the basic food components, proteins, fats and carbohydrates, and our augmented knowledge and use of vitamins and mineral salts.

- 2) Recognition of the importance of adequate and proper housing.

- 3) A better realization of the necessity for avoiding mental and physical fatigue, and the importance of a happy outlook.

Tuberculosis in the aged today is frequently mentioned as a problem. I have mentioned the lessening incidence of infection in our youth, but we also see many reports concerning the frequency of tuberculosis in those above fifty years of age. We must not forget that the age group of fifty years and over belonged to the youth of those years when tuberculous infection was manifested in every inhabitant of our country. We should also remember that with increased longevity at this time, sixty-two years being the average in this country, new pathological entities occupy the forefront of the mortality tables. Leading the procession today are heart disease, blood vessel and kidney conditions, diabetes, and other metabolic states which call for dietetic alterations—allowing a dormant tubercle to become active in an altered tissue chemistry and tissue reactivity.

Today, with our country compelled to enter into a state of war, the requirements are for an all-out production effort, causing shifting of masses of population, not only into the armed forces of the country, but into urban centers, where industry necessary to war has been extended to two, three, or four times the previous capacity in space and men. This, to meet the needs of the emergency. National leaders, appreciating the importance of preventing physical fatigue, of supplying dietaries which are adequate, and also, in attempting to make certain that a sufficiency of housing will also not be neglected, are considering in these preparations the maintenance of the health of our nation. If these conditions are not allowed to obtain, there

is no question but that among the fifty per cent of individuals showing evidence of tuberculous infection in this country, we must allow for the development of much tuberculous disease.

The important considerations that today exist in a further control of this disease, and, perhaps its ultimate eradication, may be listed as follows:

1) *Case Finding*—It is still most important that we discover all of the tuberculosis cases present in this country, and as we have so often reiterated in previous writings, both in the armed services and in industry. Especially should a survey be maintained to discover early disease, and prevent its spread. The simplest procedure is utilization of tuberculin tests and chest roentgen films in cases with positive reactions. When the tuberculin is potent and a satisfactory dosage is used and properly applied intradermally, very few false negative reactions are seen, and these all have a definite basis which can be determined. The x-ray film of the chest, when properly taken and interpreted, will delineate with a greater degree of accuracy the presence and extent of lung pathology than any other method we have at our disposal.

2) *Prevention by Vaccination*—Vaccination by inoculation has interested tuberculosis research workers for years. At first, dead bacilli were used, later live virulent organisms, such as B. C. G., the *Bacillus Calmette-Guerin*. We must remember that bodies or substances immune to tuberculous infection or disease have never been demonstrated; that the only supposed protective mechanism is the specific sensitization to tuberculous infection implanted, intentionally, or accidentally, in the human host. That, also, the causation of disease, where such sensitization has occurred in the presence of re-infection or secondary infection, is dependent on the degree of sensitization and the number and virulence of the secondary infecting tubercle bacilli. This allows for either the localization of these new invading organisms and their subsidence or the occurrence of serious destructive lesions. Inasmuch as sensitization cannot be made constant, the number and virulence of the secondary infection tubercle bacilli, which are accidentally met on the highways of life, cannot be determined,

and inasmuch as we have not as yet seen nor heard of any evidence that could point to the limitation of sensitization through inoculation by vaccination, which might guarantee definite localization of disease when re-infection takes place, we have refrained from recommending this method of tuberculosis prevention.

3) *Specific Therapy*—Chemotherapy in tuberculosis has received more impetus lately in an attempt at achieving the destruction of the tubercle bacillus, in vivo, without destruction of the body tissue cells in and surrounding the disease area. Jaffé has shown that only "in very few instances do blood vessels penetrate tubercle," and, therefore, with bloods vessels thrombosed in the periphery of areas of tuberculous pathology, direct action upon the bacilli in the caseous centers through the application of chemicals has limited possibilities.

The thought engendered in the utilization of bactericidal substances in chemotherapy is based on their combination with aniline dyes in the hope that a chemotactic cellular affinity for such dyes would take place and allow bacillary destruction. In recent months, there is an ever-brightening possibility of this latter occurrence. The sulfonamide group of chemicals has proven to be what is probably the single greatest discovery in combatting infection in the human body. One of this group, promin, has in animal experimentation demonstrated ability to diminish the number of viable tubercle bacilli in the blood stream and also to delay and prevent tubercle caseation. This experimentation, however, is in animals who were given promin immediately before, during and after inoculation with a virulent strain of tubercle bacilli. There is still doubt as to how this chemical or any allied chemical combination will act where tuberculous disease of the caseous pneumonic type has already been established and vascularity in the disease area has been stopped at the margins of pathological change. It is, however, to be hoped that definite benefits will accrue. If the eradication of tuberculous infection is possible through such means, this will leave only the alterations in tissue structure, which have occurred consequent on the presence of tuberculous infection prior to its eradication, to correct.

4) Continuance of our present methods of management in the presence of active disease.

a) There should be continuation in the supervision of the tuberculous, which requires that all cases be reported to the public health authorities.

b) Persistence in the usual therapeutic regime of rest; diet which is well balanced as to proteins, fats, carbohydrates, mineral salts and vitamins; and fresh air.

c) Surgical collapse procedures. Artificial pneumothorax continues to stand out as the single most effective method of collapse therapy and should be used in every instance where parenchymal destruction is evident. Its application can be made more extensively in association with intrapleural pneumolysis when adhesions prevent an adequate collapse. The development of many new selective and local surgical collapse procedures has allowed for a lessening of the number of

complete thoracoplasties, but the latter procedure, when indicated, is as yet an important life-saving operative procedure and should not be left as a last resort. Local methods to aid in cavity collapse are: extrapleural packs, paraffin rubber, tissue-substance as fascia, extrapleural pneumothorax, the Monaldi cavity aspiration, and partial or complete thoracoplasty.

Finally, I would remind you that this is a war of efficiency. A war of ingenious invention for destruction. Yet, it can only be a victorious war when the machinery developed to fight is controlled by hands of human beings who are physically and mentally fit to fight. The task of maintaining this fitness is in the hands of the medical profession. It must direct industry, labor and the armed services in setting up those safeguards which will maintain the physical needs to achieve that victory.

Ambulatory Collapse Therapy of Pulmonary Tuberculosis

Sanatorium Care versus Care by Private Physician

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Rest is the fundamental basis of therapy in pulmonary tuberculosis. First promulgated in America by Trudeau, this principle has become the credo of phthisiologists and sanatorium attendants. Varying degrees of bodily rest, from absolute bed rest to partial exercise and eventually to limited rest periods, have been advised on the basis of the degree of toxicity present in the tuberculous patient. Bodily rest is of great advantage, but its value may be enhanced with local splinting of the lung by establishing artificial pneumothorax or some other form of collapse therapy in suitable cases. In this way the diseased lung is given a chance to rest by limiting its expansibility from 10 per cent to 90 per cent. Collapse therapy also provides a means for promoting closure of tuberculous cavities, thus preventing an accumulation of sputum which may become the

source of infection for other parts of the lung, or persons in contact with the patient. The splinting of the lung likewise reduces the absorption of toxic lymph from the tuberculous focus through the lymphatics, thus reducing the tendency to toxic manifestations such as fever, sweating, tiredness and loss of weight.

Rest is best provided for in a tuberculosis sanatorium but the sanatorium is not available to all tuberculous patients. Of those who can pay for private care, the sanatorium becomes a definite burden because of prolonged stay. There is a limited maximum number of sanatorium beds available so that those who are unfortunate enough to be on the waiting list generally have nothing done for them except a periodic visit by the clinic nurse and a periodic visit to the clinic where, in most cases, a superficial examination is done and a cough syrup prescribed. Some patients may receive cod-liver oil and others

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may be given the advantages of collapse therapy. Such patients necessarily become public charges because all tuberculosis activity is generally centered around municipal or county institutions maintained by taxes. As soon as a patient is discovered to be tuberculous and his case is reported to the health authorities, the patient is continuously annoyed by the clinic nurses, and time after time drop the gentle hint that the patient need not pay a private physician for medical care that he may come to the local tuberculosis dispensary after dismissing his doctor. There are two alternatives left for the private physician interested in treating tuberculous patients. He either drops the matter entirely and has nothing to do with tuberculous patients or he treats such patients and does not report them in order to save himself the interference of the public health nurse who is trained to use every possible means of increasing the registration list of her local clinic.

Home care of tuberculous patients is the solution to the tuberculosis problem in many communities. Because lack of bed space in the local sanatoria it becomes obvious that there is no alternative. The patient must stay at home while waiting admission to the sanatorium. Such being the case, why not treat this patient in his home and carry out the necessary isolation and treatment in the home? Furthermore, why not train the local doctor to recognize and treat such patients during the course of his practice? If the local physician is incompetent to treat tuberculosis he should be trained by the local health authorities through lectures, demonstrations, and proper guidance in the care of the particular patient. Such a patient should remain under the supervision of the local doctor. Both the patient and the doctor will profit by such contact.

Collapse therapy may be instituted in the patient's home or the local hospital by referring the patient to one in the community qualified to do such work. Private physicians' care given to such patients enhances the possibilities of greater personal contact between the physician and patient and does not tend to pauperize the patient. Patients who are unable to pay regular fees should be charged accordingly and those who cannot pay should be subsidized by the payment of a nominal

fee from municipal or county funds laid aside for the care of such patients. If such patients were hospitalized in the sanatorium it would cost the local authorities from 2 to 5 dollars per day for such care. By subsidizing local tuberculosis specialists for the care of such patients the expenditure of public funds would be proportionately very small. In this way the clinic load would become lessened and a greater co-operation between private practitioner and local tuberculosis authority would be effected. An arrangement for local care of indigent patients by the tuberculosis specialist can be made by the local tuberculosis authority through proper qualifying examinations and official appointment for such work. Such work should be distributed so that only a certain maximum of patients be cared for each day, thus enhancing personal contact between doctor and patient and avoiding long waiting and delay for treatment.

Until a more effective form of therapy is developed and until sufficient institutional bed space is provided for all toxic tuberculous patients and all negligent patients, collapse therapy on ambulant patients and home care of toxic patients, will offer the greatest chance of recovery. Artificial pneumothorax is by far the simplest and safest form of collapse therapy. It can easily be carried out in the patient's home, the doctor's office, or the outpatient department of a hospital or sanatorium. After the use of this form of therapy on a large scale for ten years, we are convinced that even the induction of pneumothorax collapse does not require hospitalization. The maintenance of artificial pneumothorax is quite simple and can safely be carried out on ambulant patients.

It is obvious that a certain number of patients will present definite complications, such as adherent pleuritis, effusion, spontaneous pneumothorax, and some will come for care at a time when their lesion is too extensive to warrant the use of pulmonary collapse. However, the larger bulk of patients that generally come to the attention of the phthisiologist have few, if any, contraindications for collapse. It is this type of non-toxic patient that can be made useful to himself and to the community by giving him ambulatory therapy while he is being rehabilitated physically and economically to become a produc-

tive member of the community.

Home care of toxic patients is an inevitable necessity because of lack of bed space in various communities as compared with the number of cases known to have tuberculosis. Home care should be just as effective as sanatorium care if the attending physician will properly isolate the patient from contacts. A patient who is cognizant of the fact that he is a carrier and who lives with persons who also are cognizant of the possibility of spread of the disease, should be just as safe at home as in the sanatorium. It is the duty of the attending physician to instruct the patient and the contacts regarding the dangers of spread of the disease and supervise isolation of the patient in the home.

Unfortunately, among patients and contacts one finds two extremes, namely, phthisiophobia on one hand, and complete apathy and negligence on the other. The over-concerned patient may be treated psychically to affect a peace of mind. This can be done easily by the local physician in whom the patient has placed his faith and trust. The neglectful patient can be advised, watched, and warned; and if still neglectful, he should be properly isolated by forcible hospitalization in a sanatorium until his sputum becomes negative for tubercle bacilli. It is the latter type of case for whom the sanatorium is an absolute necessity for the sake of himself and the community.

Phthisiophobia among contacts is quite a serious problem. Unfortunately, it exists even among doctors and nurses. The fear of developing tuberculosis is so exaggerated in the minds of certain contacts that they make every possible effort to get rid of the patient by sending him to a sanatorium or the West. It is unfortunate that such a phobia exists because the patient is denied all opportunity for proper care. He becomes an outcast and his relations with his contacts become strained. After all, a tuberculous patient is no more dangerous than a case of pneumonia or other infectious disease if properly isolated. Such a fear has even permeated into a number of hospitals so that tuberculous patients are refused admission. A patient may be perfectly welcome in a hospital and be treated humanely until a diagnosis of pulmonary tuberculosis is established. From that moment on the patient is ostrac-

cised and looked upon as a dangerous untouchable. A hospital is generally the training school for nurses and resident physicians. The care of such tuberculous patients should be considered an opportunity to train doctors and nurses in the technic of isolation and care of these patients. Thus innocent and unknown exposure to tuberculous patients will never be harmful to these persons, who are trained in isolation technic.

The sanatorium offers the ideal environment and conditions for the care of the tuberculous. It prevents close contact between an open case and his friends and relatives. It offers an environment where the patient learns about rest, hygiene, and proper habits. It gives the patient a chance to stay in an airy, well-ventilated place. It gives the patient a chance to eat the proper kind of food, a balanced diet. In spite of the advantages enumerated, the sanatorium is available only to a small percentage of those who need it and there is little likelihood that enough beds will become available to accommodate all the patients with active tuberculosis. In the Chicago area there are only about 3000 beds available for a total of about 15,000 known cases of pulmonary tuberculosis. More beds may become available if arrangements can be made in general hospitals to care for the tuberculous under proper isolation technic. Such isolation need not be very rigid and no special building or special wing of a hospital is necessary. Private rooms can be used for those that can afford such an expense, or the use of small wards can be arranged for, when enough tuberculous patients avail themselves of the benefits offered by the general hospital. The patient with a diagnosis of pulmonary tuberculosis is no more dangerous than a patient with pneumonia, or pelvic cellulitis. One type of patient should be just as acceptable as the other, as long as proper precautions for isolation are enforced.

The fear of cross infection from a tuberculous patient, either to other patients or to nurses, is grossly exaggerated. It becomes therefore, a problem as to what to do with such patients. These patients must be cared for adequately, the contacts must be watched and everything should be done to prevent the patients from becoming dangerous carriers. They should be in the hands of com-

petent doctors who are trained in the diagnosis and care of tuberculosis. The special training required of the phthisiologist and chest surgeon must become available for all such patients. Unfortunately, in our experience, when a diagnosis of tuberculosis is made on a patient, everyone concerned in the case, including the attending physician, looks forward to getting rid of the patient by dumping him off into a sanatorium. Some hospital administrators are so frightened by the thought of having a tuberculous patient in their institution that they are apt to discharge the patient from their hospital even when this patient is in extremis. Such an incident occurred with a patient who developed a pulmonary hemorrhage while in the hospital. A diagnosis of pulmonary tuberculosis was made. In spite of the acute hemorrhage and the danger of moving such a patient from one institution to another, the superintendent of the hospital insisted on discharging this patient from the hospital. The attending physician, who was not a phthisiologist, was in a quandary and called me. The patient was transferred to my service at the Alexian Brothers Hospital, artificial pneumothorax was instituted, the hemorrhage was controlled and the patient finally made a full recovery.

It is sad to realize that such a condition exists in this day when we are proudly eulogizing our great advances in the control of tuberculosis. The patient with the pulmonary hemorrhage should have been given all the advantages that the hospital could offer. It should have been welcomed as an opportunity for the nurses and house staff to take care of such a patient in whom recovery is really dramatic. What was done at the Alexian Brothers Hospital could easily have been done in the other hospital, to the advantage of all parties concerned.

The mere fact that a patient has tuberculosis should not make him an outcast so that he must be isolated from his friends and relatives by being committed to a tuberculosis sanatorium. He should be treated adequately in the home or in the doctor's office. He should be placed under the care of a physician who is qualified to treat tuberculosis and who will co-operate with the family physician.

In Chicago the problem of inadequate bed

space and proper care has been handled, in the last ten years, by the introduction of ambulatory collapse therapy. Up to May 2, 1940, there have come under my supervision 9,246 patients, to whom a total of 174,917 pneumothorax treatments were given. We have seen patients with early lesions get well promptly and we have tried hard to assist those in the more advanced stages of the disease. We are thoroughly convinced that as many as 80 per cent of the cases will improve with artificial pneumothorax, if the patients are started early and are also given the benefits of rest, balanced diet, and the proper vitamin intake. When the patients present themselves for treatment in the more advanced stages of the disease the chances for recovery become diminished in proportion to the extent and type of pathology and the degree of toxicity of the patient.

Toxic patients, being strictly bed patients, should be the ones to be given preference for admission to the sanatorium. If sanatorium care is not available, these patients should be cared for at home or in a general hospital. Such patients will prove excellent material for training of student nurses and internes, in the technic of isolation and prevention of cross infection to themselves and other patients. Collapse therapy should be considered in all patients and tried in all cases that do not present contraindications to this type of treatment.

Non-toxic patients can have artificial pneumothorax induced and maintained in the doctor's office, in the patient's home, or in the hospital. Refills in non-toxic patients can be safely carried out in the doctor's office with fluorescent screen check-up of the degree of collapse and the pulmonary response to the treatment. Ancillary treatments, with calcium, gold or other drugs can be easily carried out on an ambulatory basis. Check-up of the bodily response to these treatments may be easily done in the doctor's office or the local clinical laboratory.

Complications arising during the course of refills on ambulant patients can generally be taken care of in the doctor's office or the local hospital. It is quite simple and safe in office practice to aspirate effusions, to induce oleothorax, or to irrigate pleural cavities. In offices where the doctor does not have the proper facilities, he can easily arrange

for such service in the outpatient department of his local hospital. Effusions can be reduced to a minimum when proper attention is given to the efficiency of the circulation of the patient, the elements of asepsis, and the response of the heart and lungs to sudden change of intrapleural pressure. In the last nine years, out of 9,246 registrations, we have encountered 806 cases of effusion, or 8.7 per cent of all patients under treatment.

Adherent pleuritis is a complication which may prove annoying and dangerous. In spite of careful technic, a puncture of the lung with resultant traumatic pneumothorax may result. Out of 88 cases of traumatic pneumothorax, occurring in 10 years, 82 recovered and 6 proved fatal. Air embolism may also result in cases with an adherent pleuritis. During this period we encountered air embolism in 39 cases, 29 of whom recovered.

These complications cannot be held as an argument against ambulatory care because they can occur just as well in the sanatorium as in the clinic, the general hospital or the doctor's office.

Phrenic nerve paralysis, extrapleural pneumonolysis with subsequent extrapleural pneumothorax, and thoracoplasty can easily be done in a general hospital. The patient has only to stay in the hospital long enough to recover from the acute effects of the operative procedure. Subsequent care and observation may be carried out in the patient's home or the doctor's office.

Home care of tuberculous patients, as compared with sanatorium care, has certain advantages and disadvantages. The following advantages may be considered: The patient is in an environment he has been used to and does not have to make an effort to readjust himself to a new environment. The patient can eat the foods of his own choice and garnished in accordance with his own likes and dislikes. The patient is not in contact with routine sanatorium gossip regarding the progress or morbidity in other patients and in this way he may have peace of mind. The doctor who sees the patient in the home is bound to take a little more personal interest in the problems arising during the intervals between visits, because he has less to do than the sanatorium doctor who makes rounds daily and merely looks in and

gives routine orders. At home the physician will be likely to examine the patient more carefully at every visit and as often as he presents new findings. The attitude of the patient towards his own condition is influenced favorably by contact with problems relating to his home and relatives, and this enhances his desire to get well. The cost of maintenance of the patient in a sanatorium is diminished or entirely eliminated. If the patient is in a private sanatorium, there is a constant drain on the family treasury of \$25 to \$50 per week in addition to incidental expenses. This, of course, is over and above the current expenses for the upkeep of the home. If the patient is in a tax-maintained or endowed sanatorium, the expense is a minimum of \$2.00 per day and may exceed \$10.00 in some cases. With home care the patient is likely to become rehabilitated earlier by weeks or months, because the changes in the condition of the patient become obvious during the periodic careful examinations. By caring for the patient, the contacts become educated in the prevention of cross infection, and also in the value of developing a resistance against the disease.

Among the disadvantages of home care and advantages of sanatorium care the following may be considered: The possibility of tuberculous infection among careless and unscrupulous patients and contacts. Home conditions at times, due to certain incompatibilities and maladjustment, are not satisfactory enough to be conducive to improvement. Poverty may be a sufficient factor to prevent the purchase of food for a balanced diet, and of such medication as is necessary. In such cases the patient may not have an opportunity to avail himself of the services of a chest specialist and thus is neglected. Indigent toxic patients will not be able to enjoy the benefits of good nursing supervision and periodic laboratory checks as to the progress of the pathology.

Summary

This paper is a plea for the emancipation of the tuberculous patient. As soon as he is labeled tuberculous the patient should not become an outcast, regardless of his station in life. He should be given all the benefits of modern care and be saved from pauperization. The care of such patients should be

entrusted to properly qualified private physicians in order that the patient may not become just another case but may be treated as an individual. Private care by properly qualified physicians will aid the patient in keeping his own identity as a member of his local community, avoid his becoming a pauper, and assist in his early rehabilitation physically and socially. All this can be brought about by encouraging and training the private physician to look for cases of pulmonary tuberculosis and properly take care of them. The family and physician can work in close cooperation with the chest specialist so that the patient may not be neglected at any time. By special arrangement with the tuberculosis authority in the local community indigent ambulatory patients may be treated in the office of the chest specialist and bed patients be treated at home or in the local general

hospital at a cost much lower than that of maintaining a large sanatorium. The sanatorium should be restricted especially to negligent open cases who are dangerous to their contacts and also to toxic bed patients who do not have the necessary facilities at home for proper care. Tuberculosis should not become synonymous with pauperization and socialized medicine. With proper training the general practitioner, the hospital administrator and his resident staff can be made tuberculosis conscious so that the disease can be more easily detected and proper humane isolation be established. Tuberculosis will always be a problem and should concern not only the few specially trained persons, but all who are interested in treating human illness.

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Some Points on Tuberculosis for the General Practitioner

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In all phases of medicine the specialist is constantly encountering the errors and misconceptions of fellow physicians possessed of less detailed knowledge. Experience with such instances has been the stimulus for this paper. The subjects to be considered concern the private physician and his knowledge of tuberculosis, evaluation of the stethoscope, evaluation of the x-ray, evaluation of "primary" pleural effusion, the nature and evaluation of the tuberculin test, the collection of sputum, the relativeness of "negative" sputum, and the induction of artificial pneumothorax by the private physician.

The Private Physician and His Knowledge of Tuberculosis—As a rule it is difficult to arouse the general practitioner to a sustained interest in tuberculosis; and it is difficult, therefore, to get him to keep abreast of the subject. Patients with tuberculosis are usually referred to sanatoria. They thus contribute a very small part to the average physician's income. This does not necessarily imply that such physicians are mercenary. The field of general practice is an enormous

one, and the physician cannot be condemned for neglecting the study of a disease he rarely if ever treats.

Another major factor promoting lack of interest in tuberculosis, and therefore lack of knowledge in tuberculosis, is the prevalence of a wholly unjustified, fatalistic pessimism toward prognosis in the disease. This in itself is based on a lack of knowledge as to how aggressively the disease is being subjected to active therapeutic measures in the modern sanatorium. The prognosis for minimal and even moderately advanced cases is, in general, exceedingly hopeful.

Despite seemingly justifiable reasons for a lack of interest in tuberculosis, the general practitioner has much to gain by being familiar with the modern treatment of the disease and with the very favorable results thereof. Without such familiarity he cannot have the optimism which is so often needed to mitigate the patient's first reaction to the diagnosis of tuberculosis. Nor can he have the persuasive arguments which will give his advice the power of conviction

when the patient first objects, as he nearly always will, to going to a sanatorium. Nor can he know what his patients will think of him after their sanatorium sojourn.

The advice and encouragement which the private physician gives to his patient after diagnosing tuberculosis will not only have a paramount influence on the attitude and cooperation of that patient in the sanatorium, but will also determine whether or not the patient will willingly return to the supervision of his private physician when discharged from institutional care. There are few patients who, after some weeks in a modern sanatorium, are not able to make a shrewd guess as to how much their referring private physician knows about tuberculosis. After several months on a sanatorium regime, the patient usually has a very decided opinion as to whether he does or does not want to return to the supervision of his private physician on discharge. Every sanatorium physician is put on the spot numerous times a year when patients consult him in regard to this issue. It is a matter of pleasure and relief for the sanatorium physician to be able to refer his discharged patients back to a physician whose judgment is respected.

The diagnosis of tuberculosis is pre-eminently a field of the general practitioner. The latter should be an expert on all phases of the diagnosis of the disease. Likewise, although he cannot reasonably be expected to follow all the current literature on tuberculosis, he should have a reading acquaintance with the chapters on treatment in the better monographs on the subject.

Next to diagnosis, as a rule the private physician's most important service to his tuberculosis patient is the periodic check-up following arrest of the disease. These periodic check-ups should be continued for years, perhaps for life. Time intervals will depend on the individual case. A short bit of advice may here be given in respect to the periodic check-up: Always take an x-ray. It is the only way to be sure. Any other method is a guess. The fluoroscope, particularly, should not be relied upon either for early diagnosis or for follow-up examinations. Fluoroscopy, even in the hands of experts, misses too many early cases and too many early reactivations.

The Stethoscope—Many physicians have an exaggerated idea of the value of the stetho-

scope. This idea may relate to a childhood awe of the family physician and his "telephone," but it is more likely the reaction of personal humility to pedagogic reconditeness encountered in medical student days. At all events, exaggeration of the value of the stethoscope, particularly in the detection or elimination of tuberculosis, has led to countless tragedies. Every tuberculosis specialist and resident is familiar with scores of histories in which patients with well advanced long-standing disease have stated that their physician examined them with the stethoscope one to six months previously and pronounced them sound. It may be protested by the initiated that, had the physician known how to use his stethoscope, the tragedy would not have occurred. Admitting that the value of auscultation varies with skill, such a protest is chauvinistic to say the least. The stethoscope has inherent diagnostic limitations, and those most familiar with diseases of the chest know that these limitations are by no means restricted to early or minimal cases of tuberculosis. The Subcommittee on Case-finding Procedures in Tuberculosis of the American Public Health Association has come to the conclusion that minimal cases of tuberculosis are almost invariably missed on examination by percussion and the stethoscope.¹

The stethoscope had a justly hallowed reputation up to the time of the clinical application of x-rays. The latter, however, have given us a new evaluation of the stethoscope in which unjustified confidence has been tempered by a timely skepticism. In the diagnosis of early, i.e., eminently treatable, tuberculosis, the stethoscope is most effectively evaluated as a crude, inefficient instrument. The general acceptance of this, to some, heretical fact will save thousands of lives annually. All tuberculosis case-finding authorities are agreed that the general practitioner is, or should be, the most important case-finding agent. This being so, it is imperative that the physician at large should keenly appreciate that, while his stethoscope may tell him no lies when signs are audible, it often fails to tell him the truth when signs are inaudible.

The X-ray—Technically, the finding of tubercle bacilli in the sputum offers the only method of absolutely proving the diagnosis

of pulmonary tuberculosis. However, a great many cases of active tuberculosis have negative sputums, and such cases will often be missed if not x-rayed.

In the diagnosis of tuberculosis the x-ray takes precedence over the sputum examination because, if the latter is negative, disease may still be revealed by the x-ray; while if the sputum is positive, an x-ray must be taken to learn the nature and extent of the lesion. Information given by the x-ray is the absolute *sine qua non* on which the modern treatment of pulmonary tuberculosis is based. Knowing that the sputum is positive is important from the point of view of immediate differential diagnosis after the x-ray has been taken. However, if the sputum is negative, serial x-ray observation of the patient soon leaves little doubt as to the nature and progress of the lesion being dealt with.

That the present-day value of the x-ray in the early diagnosis of tuberculosis should be questioned seems incredible. Yet more than one otherwise well-informed physician has queried the writer on this subject. The confusion, of course, lies in the latitude of the term "early" and in individual interpretation of its meaning and limits. Technically, a person has tuberculosis the minute he begins to react to the first invading tubercle bacillus. However, the x-ray cannot reveal a single microscopic tubercle, and when disease is classified as clinically early it may be quite old chronologically. Practically, the physician is concerned with "early" tuberculosis in the clinical sense, i.e., with the extent of disease present. From this point of view the x-ray is an extremely sensitive diagnostic instrument. It can demonstrate tenuous infiltrations long before these are detectable by the stethoscope, and long before they have advanced beyond the stage in which the prognosis for cure is almost one hundred per cent.

Tuberculosis is every bit as much a threat to life as is an attack of acute appendicitis. If the suspicion of acute appendicitis warrants a laparotomy, certainly the suspicion of tuberculosis warrants an x-ray. Many physicians hesitate to advise an x-ray because the latter is expensive and the patient not too well off. The tuberculosis-minded physician knows that neither he nor the patient can afford *not* to have an x-ray taken.

This is particularly so when examining Mantoux-positive contacts to a known open case of tuberculosis. Not to x-ray such contacts will inevitably lead to the frequent missing of active cases of the disease. To miss just one case, and to allow that case to develop advanced disease, may not only cost the patient's life, and perhaps the physician his reputation, but will cost somebody—relatives or the state—enough to pay for hundreds, possibly thousands, of x-rays. Multiply these costs by the number of cases infected by the one in question, and the cost of not taking an x-ray may be staggering. If a patient cannot afford to pay for an x-ray, he should be referred to an agency that will take it free of charge. No state can afford to be without such agencies.

Pleural Effusion Without an Apparent Pulmonary Lesion—James Alexander Miller states² that pleural effusion occurs as a prephthisical phenomenon in about one out of every four cases of pulmonary tuberculosis. He also points out that between one-third and one-half of all adults with pleural effusion develop obvious pulmonary tuberculosis within the following few years.

The differential diagnosis of pleural effusion is seldom difficult. Causes other than tuberculosis are usually easy to rule out. They are: heart disease, renal disease, malignancy involving the mediastinum or pleurae, acute rheumatic infection, beri-beri, and the "terminal" effusion that accompanies the lingering illnesses of old age. Having excluded these causative conditions, and neglecting those which are medical curiosities, the physician will be almost one hundred per cent correct in assuming that an effusion is tuberculous. It may have a greater effect to state that the physician will be almost one hundred per cent wrong if he assumes that such an effusion is non-tuberculous.

A tuberculous pleural effusion almost invariably means active pulmonary tuberculosis.³ Occasionally the tuberculous focus may be under the parietal pleura. There may be active associated hilar gland infection. The pulmonary lesion may be obvious, but commonly the best roentgenographic technique fails to demonstrate it. In these cases the responsible lesion may consist of but one or two soft, microscopic, subpleural tubercles. To those not familiar with the variable re-

sponse of the body to the tubercle bacillus, a large effusion may seem entirely out of proportion to such a tiny, invisible focus. To those who are familiar with such responses, a massive effusion is consistent and to be expected. A tuberculous pleural effusion is the result of an acute exudative reaction to a specific allergen by a large surface-area which has become sensitized to that allergen. As in the case of most allergies, the quantity of irritant present may be very, very small.

It is far more pertinent, then, to state that *all* patients with a "primary" tuberculous effusion *have* pulmonary tuberculosis, than to state that a certain number of these patients will *eventually* develop pulmonary tuberculosis. If it is accepted that all these patients *already have* active pulmonary tuberculosis, and already have advanced the first step toward potential, full-blown phthisis, the indicated treatment leaves no room for controversy. It will be the treatment of active pulmonary tuberculosis. This will include at least six months at bed rest and modified bed rest. The periodic follow-up of these cases should be just as close as if gross disease had been present.

The wide discrepancy in statistics on the incidence of gross, active, pulmonary tuberculosis following "primary" pleural effusion is probably dependent on differences in care which the patients have taken or received. The degree of care taken will usually depend on the attending physician's advice and on the intelligence and economic circumstances of the patient. Patients who resume activity early and who remain in contact with the original source of infection are more likely to develop gross pulmonary lesions.

Jaffe states⁴ that tuberculosis of the pleura is always secondary. Schuman states⁵ that in 80 per cent of cases of "primary" pleural effusion Jacobaeus has been able to observe pleural tubercles through the thoracoscope. It is probably safe to assume that all patients with "primary" pleural effusion have tubercles just beneath the pleura. When the effusion becomes absorbed, the visceral and parietal pleurae become adherent in the region of the subpleural tubercles, and usually elsewhere as well. This anatomical fact is probably of considerable significance in regard to later reactivation of dormant subpleural tubercles. Marked inspiratory excursions

will exert traction on the adherent areas and may well produce sufficient trauma to the tuberculous focus to result in extension of the disease process. Traction over a healed tubercle is much less likely to cause extension than traction over a tubercle which is still caseous. This logical inference should alone be sufficient to caution the physician that overtreatment rather than undertreatment is indicated. Another argument for thorough treatment is that if these cases are allowed to develop a cavity, they will probably have to have a thoracoplasty. Adhesions will nearly always render artificial pneumothorax impossible.

Having diagnosed a tuberculous pleural effusion, the physician must decide how and by whom treatment is to be given. If the physician decides to treat the case himself, he will be governed, of course, by his own ideas. If he elects to refer the case to a tuberculosis specialist or to a sanatorium, it is in the best interests of the patient that the decision to aspirate or not to aspirate the fluid be left to the judgment of the physician who will actually supervise the treatment. The physician who first sees the case should, of course, always aspirate a few cubic centimeters of fluid for laboratory study and differential diagnosis. Massive aspiration for therapeutic purposes is a different matter. There is considerable controversy as to whether a "primary" tuberculous effusion should or should not be aspirated, except when removal of fluid is indicated for relief of pressure symptoms. Some physicians, without broad experience in pneumothorax therapy, routinely aspirate these effusions and institute artificial pneumothorax even though they intend to refer the case. Such treatment may not only be contrary to the ideas held by the specialist, but may result in serious complications for the patient. During the early stages of an effusion, the pleura is acutely inflamed and should be disturbed as little as possible. These cases are often unsuitable for pneumothorax because of pre-existing adhesions, and cannot often be carried for long under successful collapse because of the obliterative pleuritis which nearly always sets in. Not infrequently the fibrinous coating on the visceral pleura rapidly thickens and organizes. If this happens while the lung is in the collapsed state, re-expansion may

be impossible. Spontaneous pneumothorax, broncho-pleural fistula, and empyema are not uncommon consecutive complications in primary effusions treated by inexpertly administered pneumothorax.

The Tuberculin Test—The number of physicians who are diffident in their interpretation of the meaning and value of the tuberculin reaction is surprising. One of the most common errors is the assumption of a relationship between the intensity of the tuberculin reaction and the activity or extent of the disease that may be present. In this connection it should be remembered that the tuberculin reaction is an allergic reaction and that its intensity is a measure only of the degree of allergy present. The degree of allergy present is merely a measure of the ability to react in a certain manner, and bears no consistent relationship to the activity or extent of any disease that may be present.

In the interim between attacks, victims of asthma and hay fever retain the ability to react to the allergens which cause their attacks. Likewise, but with no pretense to extend the analogy, the individual who once has been sensitized to the tubercle bacillus retains the ability to react to tuberculin years after the original attack of tuberculosis has been completely arrested. This individual may have a much more intense reaction to tuberculin than a person with active disease.

The subject of allergy in tuberculosis, particularly in relationship to immunity, is highly complex and by no means well understood, but on one clinical point the physician can be positive: The tuberculin reaction does not measure the activity or extent of disease present or previously present, and cannot be used to measure the progress of known disease. There are many variables in the allergic state. Perhaps the most constant factor is the individual constitution, i.e., inherited qualities.

Another conception not uncommonly encountered is that a severe tuberculin reaction indicates a high susceptibility to the disease tuberculosis and, therefore, not too good a prognosis if disease should develop. Actually, there is much good argument for the reverse conception. As just indicated, the relationship between allergy and immunity in tuberculosis is still a disputed question.

The general practitioner should keep the

following facts in mind in regard to the tuberculin reaction:

1) The tuberculin reaction is not a test for tuberculous disease; it is a test for tuberculin allergy.

2) Being a test for allergy, a positive reaction indicates nothing more than previous sensitization to the tubercle bacillus. The disease causing this sensitization may have long since been arrested. The test does not distinguish between active and arrested disease.

3) Tuberculin allergy, like any other allergy, waxes and wanes in intensity with many variable factors. Patients with known tuberculin allergy may give a negative reaction during acute infectious diseases, in tuberculosis associated with marked toxemia, especially in miliary tuberculosis, and in tuberculosis approaching the terminal stage. An attack of simple acute tonsillitis with fever may render the tuberculin test negative in a child. Severely debilitated or malnourished individuals, especially the aged, may fail to react to tuberculin, or to any other allergen for that matter. In all these cases the individual's reactivity is said to have been depressed to an "anergic" state, and the lack of reaction is termed a false negative.

It is the false negative reaction which is of clinical importance, because it may lead to the overlooking of active tuberculous disease. It should not be forgotten that it may require several months for tuberculin allergy to develop following the onset of a primary infection.

4) With properly prepared tuberculin, genuine false positive reactions are uncommon. A false positive reaction may be obtained in leprosy, in actinomycosis, and in blastomycosis.

5) Allowing for false reactions, the specificity of the tuberculin (Mantoux) test is very high. In the higher concentrations used for clinical testing, a negative reaction rules out tuberculosis with an accuracy approaching 98 per cent.

6) A positive tuberculin reaction merely indicates allergy. The clinical significance of this allergy must be evaluated in relation to the age of the individual. In older individuals whose chances for acquiring infection have extended over many years, a positive reaction is much more likely to be associated

with inactive than active disease. Under the age of two years, a positive tuberculin test is almost always an indication of active disease. Under the age of five years, a positive test should always incite a thorough investigation to exclude active disease. Above the age of five years, the value of the positive reaction as an indicator of likely active disease falls off sharply.

The greatest value of the tuberculin test lies in the ability of the negative reaction to exclude tuberculosis at all ages, and in the ability of the positive reaction to incriminate tuberculosis during the first few years of life.

On Collecting Sputum—The average physician would not trust a completely inexperienced person to collect blood for a blood count. Yet the same physician will trust completely inexperienced patients to "collect some sputum in a bottle." The decision as to whether a lesion revealed by the x-ray is tuberculous or not is a vital decision and may often be reached in a very short time by the careful examination of a carefully collected sputum specimen. Carelessly collected sputum may be of no value and may result in delays which allow unnecessary progression of the lesion.

Many individuals do not distinguish between sputum, "spit," and naso-pharyngeal secretions. "Sputum," after all, is a fairly technical word, and there are probably not many physicians who appreciated its specific meaning before they studied medicine. There are plenty of persons to whose vocabulary the word "saliva" is unknown, and who regard "sputum" as the doctor's polite word for their less delicate "spit." Telling a patient to "expectorate into a bottle" is another source of misunderstanding. To many people, "expectorate" means just to spit or to clear the naso-pharynx and then spit.

When requesting a patient to bring a specimen of sputum, the source of the latter should be specified. The instructions commonly given by the writer are: "Cough up the phlegm from deep in your chest and spit it into the bottle." This is supplemented by stating that the specimen collected is to contain as little "spit" and naso-pharyngeal secretion as possible. If the patient is conscious of bringing up sputum only a few times a day, he is instructed to wait for such times to obtain the specimen. The patient should always be

instructed to bring the specimen which he coughs up from his chest immediately on awakening in the morning.

Children, and many adults, swallow their sputum. These individuals will often state that they have no cough and that they raise no sputum. On questioning, however, they may admit that they have to clear their throats and swallow frequently. Their true sputum may be laden with bacilli and well worth collecting in the proper manner.

Some persons will deny they have any sputum even when the physician can hear it rattling in their throats. Probably this is often as not a defensive psychological reaction. The individual dreads the idea of tuberculosis, and subconscious persuasion influences her, sometimes him, to hinder the establishment of such a diagnosis as much as possible. These instances exemplify the psychological phenomenon of resistance. Then, again, there are individuals of such a fastidious temperament that they cannot allow themselves to be persuaded that they, of all people, could have such a horrible thing as sputum. Persons with psychological reactions such as the above will often fill their bottles with negative saliva when they could easily fill them with positive sputum.

When it is suspected that the collection of sputum specimens by the patient is unsatisfactory, resort should be had to more certain methods. These include the "laryngeal mirror test" (coughing tracheo-bronchial secretion directly onto a laryngeal mirror held over the larynx), gastric lavage, sputum concentration, cultures, and guinea pig inoculation.

The Relativeness of Negative Sputum—It should not be forgotten that the term "negative sputum" is a relative one only in many instances. It has been estimated that more than a hundred thousand bacilli must be present in each cubic centimeter of sputum before they can be found in a direct smear.⁴ The reason, of course, is, by analogy, the difficulty of finding a needle in a haystack. Certainly a sputum which contains one hundred thousand bacilli per cubic centimeter can be considered negative in only a technical sense. The relativeness of "negative" sputum undoubtedly gives rise to many a false sense of security, and provides a good argument for doing routine concentrates and cultures.

Twenty-five thousand bacilli per cubic centimeter of sputum mean tuberculosis just as emphatically as do five hundred thousand bacilli per cubic centimeter.

The relativeness of "negative" sputum also emphasizes the valuelessness of a single sputum examination. A patient's sputum may constantly contain, say, seventy-five thousand bacilli per cubic centimeter. The laboratory may examine a score of specimens of this sputum by direct smear before being lucky enough to find a few acid-fast.

The sputum may not contain tubercle bacilli, even by culture or guinea pig inoculation test, in advanced productive lesions, in late acute exudative lesions, and in healed fibrotic lesions, although the x-ray may indicate extensive involvement. Thus a negative sputum by no means excludes pulmonary tuberculosis.

Artificial Pneumothorax

Artificial pneumothorax is the mainstay of collapse therapy in pulmonary tuberculosis. The administration of artificial pneumothorax is a relatively simple procedure, but it is one which can have more tragic consequences if done inexpertly than almost any other procedure in medicine. By "inexpertly" is meant not only in regard to technique but also in regard to the judgment as to whether or not artificial pneumothorax is indicated. Many cases of tuberculosis are not suitable at all for artificial pneumothorax, and the entire course and prognosis of a case may be unfavorably altered by its injudicious administration. Many cases which are unsuitable for artificial pneumothorax when first seen may be ideal cases a month or so later when bed rest has reduced an acute toxic state. The induction period—the initial filling and the first few refills—is a critical time in pneumothorax administration. It is so critical that those most experienced in this form of therapy will not risk the chance of inducing artificial pneumothorax in the office, and certainly never in the patient's home. Fluoroscopic and x-ray control are absolutely essential. It may be immediately evident after the initial filling that the pneumothorax must be abandoned, or continued with great caution as to size and frequency of refills. Failure to recognize these indications may initiate a sequence of spontan-

eous pneumothorax, fluid formation, bronchopleural fistula, empyema, and the eventual necessity of doing a complete thoracoplasty. The induction period of pneumothorax is the most likely time for the occurrence of air embolism. Many patients are robbed of the continued benefits of pneumothorax by an obliterative pleuritis resulting from fluid formation which, in turn, results from premature induction in toxic cases or from failure to recognize the presence of tense adhesions.

If the physician intends to refer his tuberculous patients, he should refrain from instituting any active measures of treatment unless some urgent condition, as hemoptysis, demands such treatment. It is not fair to the patient to neutralize the benefits of reference to the specialist by a contraindicated pneumothorax or by the complications of pneumothorax. It is not fair to the specialist to ask him to remedy the incurable complications of a curable disease, or to ask him to continue a form of treatment which should never have been instituted but which, unfortunately, may now be irreversible. The inexperienced physician is not being fair to himself by indiscriminately inducing pneumothorax. His lack of judgment will be perceived immediately by the specialist and sooner or later by the patient. Tuberculosis is a disease which requires years of treatment. There is seldom any emergent need for the institution of active treatment. The time and method of active treatment should be chosen only after careful consideration of the case. The question as to whether the patient should have bed rest alone, phrenic paralysis, artificial pneumothorax, thoracoplasty, or a combination of these measures, involves judgment and experience which the specialist alone usually possesses.

The Physician's Alertness to Tuberculosis

Regardless of the fact that the x-ray offers a very exact method for the early diagnosis of tuberculosis, the x-ray will not be taken and the disease will not be diagnosed early unless the physician is alert to the prevalence and insidiousness of tuberculosis. Tuberculosis is often far advanced before it gives rise to pronounced manifestations. This being so, the physician must maintain a high index of suspicion toward such trivial symp-

toms as unusual fatigue, protracted cough following a cold, persistent ache in the chest, slight weight loss, and the complaint of feverishness. If tuberculosis is to be diagnosed early, it is manifestations such as these which must suggest the x-ray.

There is vast room for improvement in the early diagnosis of tuberculosis. Even today about 54 per cent of patients admitted to sanatoria have far-advanced disease, while only 16 per cent of the cases are classified as minimal.

Tuberculosis is the seventh leading cause of all deaths. It is the most common cause of death up to the age of forty-five, if accidental causes are excluded. Contrary to common opinion, it is one of the most common

causes of death in old age. With these facts at hand, it is not trite to advise the practitioner to keep tuberculosis in mind always.

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The Detection of Early Tuberculosis in Detroit

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We all know the personal satisfaction derived from a correct diagnosis early in the course of disease. This applies particularly to acute conditions and especially where surgical intervention is indicated. It is perhaps no less important, however, in so-called chronic diseases because early diagnosis and instigation of proper treatment often mean the difference between success and failure in caring for the patient. This certainly holds true in pulmonary tuberculosis where modern collapse therapy is more likely to be successful in unilateral lesions and when the duration of the disease is short.

Until recently the diagnosis of tuberculosis often depended upon a combination of several of the following factors: contact history, symptoms, physical signs, sputum examination, tuberculin test (especially children) and x-ray evidence. A diagnosis of tuberculosis was considered only with the following symptoms, unless otherwise accounted for: weakness, indigestion, loss of weight, increased temperature (afternoon or evening), persistent cough or expectoration, night sweats, hemoptysis—especially of one teaspoonful or more—or a pleurisy.

Though these factors still remain most important, it has been shown conclusively that this disease produces no appreciable symptoms in many cases until it has progressed to a moderately advanced stage. The detection of early tuberculosis, from the family physician's point of view, thus may be divided into two broad groups: (1) symptomatic and (2) asymptomatic. The general practitioner is chiefly interested in the first or symptomatic group since the great majority of the population consults him only when disturbing symptoms appear. This factor in itself, it is recognized today, greatly handicaps the physician in his ability to make an early diagnosis, however alert he may be.

On the matter of physical signs, the present status is well expressed by Chadwick: "Refinements of the art of percussion and auscultation have been developed to an extraordinary degree. The result was that many persons without tuberculosis were wrongly diagnosed, given treatment and apparently cured of a disease they never had. The family doctor has been much abused and the medical schools criticized for failing to teach their students how to make an early diagnosis. The roentgenogram came to the defense of the general practitioner and proved

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that he had been only a few degrees farther off from the true course than the ultra-trained specialist."¹

In Detroit, the Department of Health, with the cooperation of the Wayne County Medical Society and the Detroit Tuberculosis Sanatorium, carried out a thorough concentrated program among the general public for several years. There were frequent radio talks, newspaper articles and wholesale distribution of posters and leaflets, the latter going into practically every home through the schools. The public was advised to go to their family physicians for examination as soon as symptoms appeared.

The 1940 Annual Report² for this city shows that 15.6 per cent of new cases of active tuberculosis were classified minimal. The results given include: (a) patients reported by private physicians, (b) low economic groups applying to Department of Health for diagnosis and care, as well as family contact examinations, and (c) cases diagnosed in hospitals. Private physicians alone reported 19.3 per cent minimal lesions, a higher proportion than the general average of 15.6 per cent (Table I). But are we satisfied with a one in five early diagnosis?

TABLE I

Type	Cases	Per Cent
Minimal active	216	15.6
Moderately advanced active	613	44.4
Far advanced active	553	40.0
TOTAL	1,382	100.0

Notwithstanding a comprehensive educational program, the percentage of early lesions remains low. It is apparent, therefore, that this disease must be approached in other ways if the high per cent of advanced cases is to be reduced. This brings us to consideration of group 2, the asymptomatic group. Here it becomes necessary to investigate the apparently healthy for the evasive early cases by tuberculin test, x-ray screening or by x-ray directly. This group is particularly drawn to the attention of those physicians who not infrequently reject the diagnosis of active tuberculosis in the absence of symptoms.

A great deal of tuberculosis case-finding work has been carried out in recent years among the general public. The results for

comparable groups are practically constant in showing that active tuberculosis can be found without appreciable symptoms and often without apparent abnormal physical signs. This is particularly true in the detection of early lesions.

Since tuberculosis is generally recognized to be a greater menace in the low socioeconomic group, in 1936 the examination by x-ray was undertaken of 1,000 unemployed homeless men. Twenty-one cases, or 2.1 per cent, of active tuberculosis were found and 46 inactive cases (Table II). One notes that

TABLE II
ACTIVE TUBERCULOSIS: SYMPTOMATIC AND ASYMPTOMATIC

Case	Age	Color	Classification	Symptoms	Signs	Contact
1	48	W	Minimal	—	—	—
2	46	W	Far Adv.	+	+	—
3	31	W	Minimal	+	—	+
4	33	W	Far Adv.	+	+	—
5	34	W	Minimal	—	—	—
6	36	W	Mod. Adv.	+	+	+
7	31	W	Minimal	—	—	—
8	43	C	Minimal	—	—	—
9	37	W	Minimal	—	—	—
10	36	C	Minimal	—	+	—
11	50	W	Far Adv.	—	+	—
12	21	W	Far Adv.	+	+	+
13	34	W	Mod. Adv.	—	+	—
14	66	W	Minimal	+	+	+
15	44	W	Minimal	—	—	—
16	42	W	Minimal	—	—	—
17	46	W	Mod. Adv.	—	+	—
18	33	W	Minimal	+	—	—
19	40	W	Minimal	—	—	—
20	40	C	Mod. Adv.	—	+	—
21	46	W	Minimal	—	—	—
TOTAL				7	10	4

symptoms were present in only 7, or 33 per cent, of those having active disease, in spite of the fact that 8 of the 21 active cases had moderately advanced or far-advanced disease. Of the 13 classified minimal disease symptoms were present in only three, or 23 per cent.³

In 1932 a survey was made of 1,432 boys and girls (ages 15 to 18) in a high tuberculosis rate area by the tuberculin test x-ray

method.⁴ Fourteen cases, or 1 per cent, were found to have reinfection tuberculosis (then called adult type disease), ten, or 71.4 per cent of which were classified minimal. Note the small number in this study showing symptoms or signs or contact history (Table III).

TABLE III
ACTIVE TUBERCULOSIS: SYMPTOMATIC AND ASYMPTOMATIC

Patient	Classification	Symptoms	Signs	Contact
1	Minimal	—	—	—
2	Minimal	—	—	—
3	Minimal	—	—	— + (father)
4	Mod. Adv.	+ (1 yr.)	Sl. +	—
5	Mod. Adv.	+ (2 mos.)	+	—
6	Mod. Adv.	—	—	—
7	Far Advanced	+ (2 mos.)	++	+ (lodger)
8	Minimal	—	—	—
9	Minimal	—	—	—
10	Minimal	—	Sl. +	—
11	Minimal	—	—	—
12	Minimal	—	—	—
13	Minimal	Sl. + (1 wk.)	—	—
14	Minimal	—	—	—

One might mention here that a great number of pediatricians routinely tuberculin test all their patients now.

It is appreciated that the small number of active cases of tuberculosis discovered by the usual means lends little inducement to general practitioners to spend much of their valuable time in handling these cases. However, when you add the asymptomatic group, the need for entering this field becomes greater, with consequent increased remuneration. Diagnosis in the large asymptomatic group is being greatly increased today among working groups and will be more so in the next few years as the result of weeding out in the Services by mass x-ray methods.

Though our diagnostic aim must be to find all early lesions, it is a worthy goal at this time to increase the minimal cases from one-fifth to four-fifths. This can be done by the family physician and all other physicians taking their proper place in dealing with the disease. Observation, between x-ray readings, of patients with benign circular lesions is an example.⁵ A successful program along this line was carried out locally for a while in

conjunction with the Wayne County Medical Society, known as The Medical Participation Program.⁶ This was certainly a move in the right direction and might well be renewed and extended in the best interests of the community and the profession.

Summary

Early tuberculosis may be divided into two groups—symptomatic and asymptomatic.

Thorough examination, including tuberculin test x-ray procedures should be carried out immediately in all patients presenting themselves with suggestive symptoms.

If symptoms are present and persist, a negative tuberculin test should not be depended upon, an x-ray being indicated before a negative diagnosis is made. It is further advisable to re-x-ray the lungs after a reasonable time should the first reading fail to show pathology.

If the diagnosis of tuberculosis is considered only in those with suggestive symptoms, a large per cent of cases are missed. This also occurs if one depends entirely on abnormal physical signs or on a contact history.

A positive tuberculin test during the first two years of life, especially the first 12 months, generally means active tuberculosis. For the age period three to five years, a positive tuberculin calls for an x-ray, repeated at intervals though negative if there are any symptoms or if there remains in the household a source of infection. The school age period 6 to 14 years has comparatively the least amount of active tuberculosis. *From 15 years upwards the reinfection type begins to appear more frequently. It is the more serious form and is mainly responsible for the spread of this disease.*

For the detection of early tuberculosis, therefore, the general public, particularly in the age group 15 to 35 years, should be x-rayed with or without a preceding tuberculin test and irrespective of whether there are symptoms or abnormal physical signs. This applies especially to adolescents and young adults applying for high school and college teams, and to all who work regularly to even a mild degree of exhaustion either because of type of work (physical or mental) or because of the number of hours so engaged.

A higher rate of tuberculosis is found in the poor sections of large cities and where

there is usually overcrowding. Where the area served by the physician is inhabited chiefly by unskilled labor he can expect to find the death rate from this disease eight times as high as among professional workers.

It is necessary for the detection of early tuberculosis that the services of a roentgenologist be made available to all physicians for both their pay and non-pay patients.

Finally, the inactive disease cases may become active if not properly advised and kept under observation. It is the writer's studied opinion that these patients will be better served under direct control of the family physician. Accordingly, it is advisable for the general practitioner to familiarize himself with inactive tuberculosis, especially early cases. The care of such patients is well within the general practitioner's field providing he is supplied with periodical x-ray interpretations.

Recommendations—In many small communities there is a lack of x-ray facilities, thus handicapping the local physicians in the diagnosis of early tuberculosis. Since the most important single factor of a successful program is the x-ray, it is suggested that the local county medical societies investigate the needs of communities and present a plan to

the proper administration authority through the health officer. The cooperation of local or nearby roentgenologists is usually assured on proper financial arrangements. Whether the purchase of an x-ray machine is necessary can be readily decided. In very small or sparsely populated areas, the roentgenologist can use a portable machine to advantage and within the financial capacity of the area served. Under any circumstances, local physicians cannot be expected to diagnose early lesions unless a roentgenologist's service is available. The cost of this service is reasonably chargeable to the community when the local physician certifies inability of the patient to pay.

1800 Tuxedo Street.

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Organization News

DR. SINGER APPOINTED MEDICAL DIRECTOR

Dr. J. J. Singer, Los Angeles, California, a Fellow of the American College of Chest Physicians, was appointed medical director of the Los Angeles Sanatorium, Duarte, California. Dr. Singer will continue his private practice at Los Angeles as consultant in chest diseases as well as his many other activities concerned with his specialty. Dr. Singer is president of the tuberculosis section of the Los Angeles County Medical Society; Director of the Rose Lampert Graff Foundation, an organization devoted to research in tuberculosis; and Associate Clinical Professor of Medicine at the University of Southern California.

The Los Angeles Sanatorium is a national non-sectarian institution for the care and treatment of indigent tuberculous patients and it is maintained by the Jewish Consumptive and Ex-patients Relief Association. During the past thirty years, the sanatorium has cared for more than 10,000 indigent patients.

ANNOUNCEMENT OF FELLOWSHIPS IN MEDICINE AND PUBLIC HEALTH

(Offered by the Commonwealth Fund of New York Through the Pan American Sanitary Bureau)
The Commonwealth Fund of New York, a philanthropic foundation established in 1918 by the late Mrs. Stephen V. Harkness, announces

that it is offering through the Pan American Sanitary Bureau fifteen fellowships for one year's study of public health subjects or postgraduate medical courses to properly qualified persons who are citizens of the other American republics. Fellowships in public health will be open to physicians, sanitary officers, technicians, public health nurses, etc. These fellows will be selected through a system of cooperation with medical and health authorities of the different countries concerned, and whenever deemed advisable they will be interviewed by traveling representatives of the Pan American Sanitary Bureau. Each fellowship will provide living allowances while the holder is in the United States, travel costs, and tuition. Knowledge of the English language will be among the requirements, and also the possession of certain specific qualifications.

The Pan American Sanitary Bureau, the international health agency of the American republics, has been for some time the recognized clearing house for medical and public health fellowships in the United States, nearly 100 Latin Americans now being in the United States under its auspices.

Application blanks giving complete information will be available through the Commonwealth Fund, 41 East 57th Street, New York; the Pan American Sanitary Bureau, Washington, D. C.; or chiefs of American Missions in Latin America.

"Information Please"

A Quiz on Diseases of the Chest

EXPERTS

Medicine: George G. Ornstein, M.D., New York City
 Champ H. Holmes, M.D., Atlanta, Georgia

Surgery: Richard H. Overholt, M.D., Brookline, Massachusetts
 Ralph C. Matson, M.D., Portland, Oregon

Physiology: Harold D. Greene, M.D., Cleveland, Ohio

Bronchoscopy: Louis H. Clerf, M.D., Philadelphia, Pennsylvania

Roentgenology: Joseph W. Post, M.D., Philadelphia, Pennsylvania

Benjamin Goldberg, M.D., Chicago, Illinois, *Presiding*

The following questions were directed to the above-mentioned experts at the annual meeting of the American College of Chest Physicians held at Cleveland, May 31, 1941. The questions were submitted by the members of the College who attended the session and were answered by the experts without rehearsal. "Information Please" with regards to diseases of the chest was inaugurated at the College meeting at New York City in 1940 by Dr. Edward P. Eglee, Regent of the College for New York State, and it has been well received at each of the annual meetings to date. The questions and replies for the "Information Please" meeting held at Atlantic City this year, will be compiled and published in a future issue of the journal.—Ed.

To: Dr. George G. Ornstein.

Question: What is the difference between gelatinous and caseous tuberculous pneumonia?

Answer: Gelatinous tuberculous pneumonia was the term given to the form of exudative pulmonary tuberculosis in which there is little death of pulmonary tissue. The disease is the result of tuberculo proteins and high allergy to the latter. There is a marked serous exudate filling the alveoli with little fibrin and cellular elements present. The fact that there is little lung destruction and that the chief element is serous fluid, reabsorption and rapid healing occurs. Fraenkel described the pathological picture well and reproduced it experimentally in animals. All forms of exudative tuberculosis that reabsorb rapidly belong to this group. Eпитuberculosis belongs to this resolving form of pulmonary tuberculosis.

Caseous pneumonic tuberculosis differs in that in the presence of a great deal of al-

lergy to tubercle bacilli, the dosage of tubercle bacilli also is large. In contrast to little destruction of pulmonary tissue in the resolving exudative pulmonary tuberculosis, the reaction is characterized by the death of the tissues involved, followed by caseation, liquification, and cavitory formation. The course of the disease is that of multiple episodes of reinfection which usually leads to the death of the patient.

Question: On what grounds can you say that exogenous re-infection is a more frequent mode of tuberculous disease than is endogenous re-infection?

Answer: The question must be clarified. Endogenous infection may mean reinfection from a secondary infection in the lung. I do not believe the question referred to the above but to reinfection from the primary phase of tuberculous infection. If the primary phase of infection had not gone on to healing reinfection may occur from this unhealed focus but that is entirely different from what the question implies. Is endogenous reinfection a frequent mode of tuberculous disease? I would say no. First, over 99 per cent of the primary phase of tuberculous infection goes on to complete healing. Secondly, if the tuberculous disease had to arise from the primary focus in the lung, the tubercle bacilli would have to move out of these old foci through the lymphatic system to the general circulation to reach other foci of lung. This movement of bacilli is not probable in animals sensitized previously by the primary tuberculous infection. (Kraus-Willis and pathologists have pointed out that there is only evidence of tuberculous infection along the lymphatics in the primary tuberculous infection, and the lymphatic system in re-

infection tuberculosis is characterized by the absence of tuberculous disease. Therefore, those investigators who have such thoughts on endogenous infection still have to prove the mode of invasion through the lymphatics from the original primary foci in the body.

Question: Discuss the delayed tuberculin reaction and significance.

Answer: I do not think that there is any definite accepted thought concerning the delayed tuberculin skin reaction. In analyzing the tuberculin reaction, we find in the true sense that it is not a specific reaction. The inflammatory reaction is caused by a toxic portion split off from the tuberculin by some form of antibody that is present in the tissue of animals and humans sensitized by a primary tuberculous infection. When I worked in Petroff's laboratory at Trudeau in 1920, we mixed old tuberculin and tuberculous diseased lung tissue in a test tube and incubated the mixture over a period of time. After eight hours, and more effective after 24 hours, some of the end product dropped into the eye of a normal and tuberculous rabbit would produce the same reaction. A toxic product was apparently let off by the tuberculin which produced the inflammatory reaction in both the normal and tuberculous rabbit. The mixture before incubation produced no such reaction in the normal rabbit but did in the tuberculous rabbit. From the above experiment I assume that a delayed reaction simply means that the tissue splits off slowly the toxic portion of tuberculin and 48 to 72 hours were required for the production of a sufficient amount of the toxic product to produce the reaction.

Question: How would you explain a fatal anoxia which developed after re-expansion of a bilateral pneumothorax of long standing for extensive disease without evidence of chor pulmonic?

Answer: The answer lies in the fact that when a lung with extensive disease that has been collapsed by pneumothorax expands, there is usually less functioning lung tissue than before the pneumothorax. This is easily explained on the basis of the development of marked thickening of the visceral pleura especially when the pneumothorax is complicated by a pleural effusion. Furthermore, the greater the collapse, small patchy atelectatic areas occur which may never again

re-expand. With the above in mind, two distinct answers may be given for the fatal anoxia. First, in reexpanding collapsed lungs following pneumothorax, the diseased areas which did not function during the collapse therapy partly reexpand and patients previously free of expectoration, now may expectorate a great deal. Some of the phlegm may obstruct the bronchus to that part of the good functioning lung and an acute anoxia develops, especially where the aeration depends entirely on both lungs functioning at its maximum. We have seen the above happen. The other explanation is in bilateral pneumothorax where a spontaneous pneumothorax occurs in one of the lungs with insufficient lung volume in the other lung to aerate the blood. This frequently happens in the maintenance of bilateral pneumothorax. A number of our bilateral pneumothorax cases have died after leaving the hospital to be cared for at the outpatient clinic. During the pneumothorax treatment the lung may be traumatized by the needle, followed by a spontaneous pneumothorax. The patients leave the clinic feeling well but before they reach home suffer from an acute anoxia. The ambulance surgeon, not familiar with the situation, attempts to alleviate the patient with oxygen. Two of our patients died before reaching the hospital. We do not discharge bilateral pneumothorax patients without giving them a card with instructions for the ambulance surgeon or the doctor called. The patients also carry a small kit with a 3-inch needle and rubber tubing and bottle for the relief of the spontaneous pneumothorax. The card also has a diagram of how and where to insert the needle into the pleural cavity and connect the rubber tubing to the needle and to a tube which reaches 1 cc. below the water in the bottle which also has a second opening in the rubber stopper for the air to escape. We have not had any more deaths of this type since.

Question: How effective is a mask in the prevention of pulmonary tuberculosis in nurses, maids and orderlies? What type of mask is most efficient? How long does the average surgical mask protect the wearer?

Answer: In the past five years we have had our student nurses at the Metropolitan Hospital under careful observation. We found that our negative tuberculin reactors convert

to positive tuberculin reactors in our non-tuberculous wards. (We do not allow our negative tuberculin reactors to have the tuberculosis service.) Because most of the negative tuberculin reactors convert to positive reactors before they finish their training the contact is with open cases of pulmonary tuberculosis on the non-tuberculosis services.

We thought of x-raying the lungs of every new admission to the non-tuberculosis service and in that way spot the open cases. Unfortunately the expense prohibited the procedure. We, therefore, decided with the next group of students entering the hospital to have them wear a mask whenever they are on a ward. We had eight student nurses that entered training and reacted negatively to 1 mg. of old tuberculin intracutaneously. One of the student broke her pledge and worked with her mask off after five months. She converted to a positive reactor. The other seven at the time of the correction of the proofs of the question on the quiz (10 months) are all still tuberculin negative. Therefore, the mask is a definite protection against tuberculous infection in the nurse. We like to use a large celluloid mask and find this type of mask the most comfortable of all. They are easily cleansed by wiping the inside of the mask with 70% alcohol.

Question: Would you treat an exudative productive tuberculosis by bed rest alone?

Answer: It has been my custom to treat this form of pulmonary tuberculosis by means of bed rest. Most important is the finding of the contact and isolating the patient from the contact. I have been most conservative about the management of the resolving exudative pulmonary tuberculosis though other clinicians have had as good results and allowed their patients after a few weeks of rest to continue on with their routine work. In one of the universities that has been the procedure with managing the students having this form of pulmonary disease. I had two nurses who insisted on carrying on after this type of tuberculosis was discovered and the disease resolved as well and quickly as those I treat with bed rest. I intend to use bed rest for the treatment of this type of case and especially make sure they are isolated from open cases at all times.

Question: Dr. Ornstein, while you are up, will you amplify that further in the state-

ment you made this morning concerning rest in the treatment of tuberculosis?

Answer: I asked the question about rest and it seems that I have to answer it. We all have come to the conclusion that all forms of pulmonary tuberculosis are not alike and run different courses. The resolving exudative forms do very well with rest and isolation from open cases. The productive form which Aschoff called the acinous nodose form of pulmonary tuberculosis also has an inactive and usually symptomless course. The disease slowly brouses down the lungs and produces the nodular type of pulmonary tuberculosis. It takes 20 to 30 years to progress sufficiently to produce enough pulmonary dysfunction. Even in the advanced stages tubercle bacilli are difficult to identify in the sputum of these cases. The disease is very chronic and symptomless and requires very little treatment.

There is need for active therapy for only one form of pulmonary tuberculosis and that is the caseous pneumonic form. To make it simpler, the cavity form of pulmonary tuberculosis. I am against rest treatment alone in this type of pulmonary tuberculosis. We may say that 20 per cent may spontaneously get well with rest treatment. Let us reverse the figures and say 80 per cent fail. Therefore, I believe that once a diagnosis of cavity is made, one should not depend on rest treatment alone, with few exceptions. Don't wait but use collapse therapy at once. Good results are obtained in from 50 to 70 per cent of the cases. Certainly no one will deny that patients at high altitudes breath faster than at sea level. If there is something in the mountainous climate, it is not resting the lungs. I do believe there is an advantage being in mountainous climate, but believe it is only a small part of the management and has nothing to do with resting the lungs.

I believe in rest in the treatment of pulmonary tuberculosis, but not as the sole means of therapy.

To: Dr. Champ H. Holmes.

Question: How much value do you now place in the sedimentation test in regard to the discontinuance of artificial pneumothorax?

Answer: Now I feel in making this decision, that the sedimentation rate is quite an important thing. It gives you a penetra-

tion into the occult that you otherwise may not have. The toxic or positive sputum cases, with a normal sedimentation rate are rare; and if the sputum is positive, that in itself could be a further guide as to whether to abandon pneumothorax or employ other collapse procedures. I would say I would be very reluctant to abandon pneumothorax if the sedimentation rate was unfavorable.

Question: What is the technic and significance of the Mantoux reaction (tuberculin) test?

Answer: I will take the significance first. A positive Mantoux or tuberculin test means that there is an infection by the tubercle bacilli somewhere within the body. It does not mean disease. If the individual has a positive skin reaction, then you know he does have an infection; but you must subject him to other methods of examination to tell whether or not the infection has eventuated in disease. The technic is very simple and I am sure familiar to you all. I think the paramount thing is to have a reliable and a fresh preparation of tuberculin. The purified protein derivative is the one of choice. That is, it is the most stable and is standardized over the country. That cannot always be said of the old tuberculin. A small amount, one-tenth cc., is injected into the skin, after the proper cleansing; usually using acetone to defat the tissues. After 48 hours, make your reading.

To: Dr. Richard H. Overholt.

Question: What is the advantage of silk sutures over catgut in chest surgery?

Answer: It has been quite conclusively demonstrated experimentally that silk is tolerated by tissues better than catgut. For solidarity of healing, in our opinion, it is preferable to catgut. We have used silk in the past three years exclusively in clean cases. Particularly in thoracoplasty silk is favored for this reason: If the patient has excessive coughing, he may disrupt the catgut wound, whereas silk will usually hold or if it does break, it will break in a limited area. It has been our observation that the wounds closed with silk, should they become infected, will heal just as readily as catgut wounds. We have found little difference in the closing of draining sinuses in respect to type of suture material used.

Question: What do you consider the ideal

balanced combination of anesthetic agents for major thoracic surgery?

Answer: I consider the ideal anesthetic for general anesthesia in thoracic surgery, cyclopropane with carbon dioxide absorption. For lobectomy or pneumonectomy and for the routine type of thoracoplasty, in which there is not much sputum, we believe cyclopropane with high concentration of oxygen is the ideal anesthetic. One can induce anesthesia quietly and quickly. One can then shut off on the cyclopropane and add just oxygen and maintain anesthesia on low concentrations of the drug permitting high percentages of oxygen. The recovery from the anesthetic is rapid. Within two or three minutes following the conclusion of the anesthesia the patient is awake and able to cough. The advantage of operating upon extremely ill and bad risk thoracoplasty cases under paravertebral block anesthesia is being appreciated more and more. The cough reflex is at no time abolished, a distinct advantage in certain cases.

Question: What method of closure do you use in broncho-pleural fistula with an existing tuberculous empyema?

Answer: It is necessary at first to provide adequate and dependent drainage. The chest is packed with gauze after dusting the interior with sulfathiazole powder, and later a thoracoplasty is carried out. The particular type of closure depends upon the situation, that is, the location of the fistula and the condition of the underlying lung. The results are not as satisfactory as we would like, but we do believe that when preliminary sterilization of the pleural cavity can be accomplished, it is possible to close a certain number of these large fistulae and salvage some of the healthy lung.

Question: Can you tell us why the eastern statistics are not as good as the western in extrapleural pneumothorax?

Answer: The variation in results must be due to a difference in the selection of cases. It has been our feeling that one should look ahead and try and decide what will be the ultimate outcome if a temporary or permanent form of collapse is employed. Each case should be judged on its own merits. If a patient needs a permanent form, he should have a permanent form, and use that instead of a temporary or semi-permanent form of collapse. Extrapleural pneumothorax cannot

be considered a permanent form of collapse for the ultimate position of the lung is uncertain. We have used extrapleural pneumothorax only for bad risk bilateral cases that were denied the benefit of thoracoplasty. So, naturally, the outcome in such a group of patients would not be good. Any salvage, however, in a group of patients where death from extensive disease was imminent would be so much to the good. I think the difference in results between various surgeons must be a matter of selection of cases. If one treats only patients with minimal or limited disease, it is possible that very excellent results with extrapleural pneumothorax might be obtained with re-expansion of the lung later on. However, I am going to let other surgeons try this operation on the better risk cases for whom we believe thoracoplasty to be safer and of more promise from the long range point of view, and then later their final results and our final results can be compared.

Question: How would you explain a fatal anoxia which developed after re-expansion of a bilateral pneumothorax of long standing for extensive disease without evidence of chor pulmonalis?

Answer: It would be impossible to answer this question without more data about the pre-terminal condition of the patient. Certain alterations in the cardio-respiratory mechanism do take place with a shift of the thoracic viscera incident to the re-expansion following pneumothorax. Some patients who have had a resection of the lung who have been followed several months or years after operation, show a shift of the mediastinum, with a distortion of the heart and other thoracic viscera so they get into serious difficulties. In one case sudden death was attributed to such a cause. Patients seem to tolerate a shift to the left better than to the right. Recently, Dr. Stone, who is here today, was called to see a post-pneumonectomy patient who suddenly presented an alarming picture with an extremely rapid pulse and cyanosis. It was his feeling and ours that the cardio-respiratory mechanism was disturbed by a marked distortion of the thoracic viscera. A thoracoplasty was performed under paravertebral anesthesia. Immediately there was a drop of pulse and respiratory rate and the patient improved. I am convinced that the distortion of the mediastinum

with shift of the heart, especially to the right, affects the great vessels and the heart. When pneumothorax cases are re-expanded, we must watch carefully for disturbances that may take place in connection with a distorted position of the thoracic viscera.

Question: What complications, if any, have developed in cases in which a Semb type operation has been done? Are they more common on the right or left side?

Answer: The most common complication, of course, is the formation of excessive fluid in the apicolytic pocket. This may exert pressure on the underlying lung. The pressure of fluid in the space may tend to cause a separation of the upper part of the wound, especially in patients who have severe coughing spells. If the patients are watched carefully, and if excess fluid is removed by aspiration, this complication is of no consequence. Infection of the apicolytic space is a serious complication that may be encountered. Of course, in carrying out surgery tissue is exposed, bacteria may be introduced, and infection may follow. Normally, tissues will resist the introduction of a few bacteria. Thoracoplasty patients are particularly handicapped in this regard to several factors. Chronic illness has lowered general resistance. The wound is large and is closed leaving a large dead space. In thoracoplasty the surgeon must be sure he does not introduce bacteria while the tissues are open. The surgeon must also be sure that the lung is not injured during its mobilization, as bacteria may be liberated from infected lung tissue. If every precaution is taken, there should be very few complications from the Semb operation. It is my impression that complications are not encountered more on one side or the other.

Question: What is the treatment of endobronchial tuberculosis causing almost complete stenosis and atelectasis?

Answer: I would agree if the patient is doing well clinically, is free of symptoms and is not apparently suffering from suppuration distal to the stenosis, then, of course, a resection, either lobectomy or pneumonectomy, is not indicated. However, I think in the future that pulmonary resection for this type of lesion, which threatens life on account of drainage difficulties or an extension of the process into the trachea or contra-

lateral bronchus, will be employed with increasing frequency. The resection must be carried out while the other lung is sound.

Question: In the treatment of pure tuberculous empyema (secondary infection ruled out by repeated aerobic and anaerobic cultures) plus a pleuro-bronchial fistula, do you do an open drainage before going ahead with thoracoplasty?

Answer: Yes. I think I can answer that question without qualifying it. Patients who have fairly large fistula are very apt to spill unpredictable amounts of tuberculosis material over into the opposite lung during operation. I think the safest thing is to provide external drainage and follow with any suitable procedure to bring the chest wall down to meet the lung.

Question: In the management of unsuccessful extrapleural pneumothorax which has become complicated by tuberculous empyema, would you advise re-expansion followed by thoracoplasty?

Answer: Some of these questions are a little bit difficult. Much depends upon the condition of the underlying lung. If there had been considerable destruction of the underlying lung by the disease, I believe that one would want to bring the chest wall down to meet that lung without trying to re-expand it first. The same principles should apply when dealing with trouble developing in extrapleural pneumothorax as apply when handling complications of intrapleural pneumothorax. The best treatment is to avoid these troubles. When tuberculous empyema develops in either case, I believe that the best solution is to remove the pus by aspiration, replace by air, and then obliterate the space by moving the chest wall to a new location.

Question: Have you used annealed steel wire for closure of a bronchus in lobectomy and pneumonectomy, and do you think it is superior to silk?

Answer: I have not used silver wire in the closure of the bronchus so that I do not have an opinion as to its superiority to silk. In our experience, closure of the bronchus with interrupted silk sutures has been quite satisfactory. Healing without fistula formation has been accomplished in most instances when we were not treating a suppurating lung. The silk sutures are placed in the stump as end sutures—then mattress sutures above. Re-

cently we have applied sulfathiazole powder directly on the stump after its closure. The area is then covered with pleura or muscle tissue. The thorax is closed without drainage. Silk sutures have the advantage of being handled well should infection develop at the point of suture. The patients may cough them up or some may be removed bronchoscopically. I would hesitate to use silver wire fearing that such suture material would not work itself free from the stump as easily as silk in the event of infection. I hope Dr. Matson will try silver wire and let me know how he gets along.

To: Dr. Ralph C. Matson.

Question: What is the advantage of silk sutures over catgut in chest surgery?

Answer: We are using cotton thread instead of silk in surgery.

Question: How long should I wait for adhesions to stretch before doing pneumonolysis?

Answer: A few years ago in our first work we said six months and with improved techniques and other factors, we worked down to three to five months. Now in most of our cases we go in very early. We don't wait for inspection.

Question: What is the anesthetic of choice for lobectomy? Is Vitamin K of any value for hemostasis?

Answer: I think Vitamin K is valuable, and the choice of anesthetic is cyclopropane with helium.

Question: Have you used annealed steel wire for closure of a bronchus in lobectomy and pneumonectomy and do you think it is superior to silk?

Answer: I haven't used it and I don't think it is superior to silk.

To: Dr. Harold D. Green.

Question: What change, if any, blood circulation time takes place in patients upon whom a thoracoplasty has been done? We might assume that it is a complete thoracoplasty, and therefore, a collapse of one entire lung.

Answer: I think first I should define what might be meant by circulation time in this particular case. The total circulation time as usually measured from systemic vein through the lungs to systemic capillaries might be divided into the circulation time from the periphery to the lungs, the circulation time

through the lungs, and the circulation time from the lungs to tissues. While I do not have offhand any exact data on such measurements, I believe one might suspect an increased total circulation time due to decreased speed of flow through the lung on the basis of physical principles involved. Not having the exact data available, I can't give you the information.

Question: What is the most negative intrapleural pressure on record? Or can you tell us something about the intrapleural pressures and their usual averages and perhaps extremes?

Answer: The most negative intrapleural pressure I have run across would be somewhere around minus 15 to 20 mm. of mercury in the experimental animals.

Question: What animal?

Answer: The dog. I doubt if you would see any much less than 40 or 50 mm. of mercury.

Question: How about human beings?

Answer: That, I am sorry, I can't say.

To: Dr. Louis H. Clerf.

Question: How successful is bronchoscopic treatment of tuberculous bronchial stenosis causing partial or complete obstruction?

Answer: Bronchoscopic treatment has not been particularly successful. Attempts to dilate cicatricial stenosis have given temporary relief. Many methods have been tried. Dr. Kernan of New York has done quite a bit of work along these lines, but I do not believe he has arrived at any definite conclusions. Briefly stated, bronchoscopic treatment of cicatricial stenosis of tuberculous origin is not particularly successful and benefit secured is only temporary.

Question: What type of treatment is indicated in tuberculous ulcerative bronchitis?

Answer: The problem of tuberculous bronchitis is interesting and also is difficult to evaluate from the standpoint of treatment. As you know, our experience in the treatment of this condition is of brief duration. We have not had an opportunity to follow cases sufficiently long. Plans of therapy for tuberculous ulcerative bronchitis vary from expectant treatment to the carrying out of all sorts of measures. There are those who believe that this condition will clear up or get worse spontaneously irrespective of treatment, and that these changes depend largely

on the progress of the pulmonary tuberculosis. Others use silver nitrate as a topical application, varying from 5 to 30 per cent, electrocoagulation, cauterization and many other forms of treatment. Frankly, I have an open mind on the whole thing. I have seen patients with ulcerogranulomatous lesions of the bronchus clear up spontaneously and others responded after therapy. I am not certain which was the better plan of treatment.

Question: Which do you use?

Answer: I used electrocoagulation for a time. I still use it occasionally. I use silver nitrate solution, usually 5 or 10 per cent in some cases. I am not certain which is better.

Question: Dr. Clerf, here is a question that requires a little amplification on your answer to the one on tracheobronchial tuberculosis asked before. It asks for the treatment of tracheobronchial tuberculosis causing marked diminution of stem bronchus lumen and resultant atelectasis.

Answer: I do not know what is the best thing to do. The narrowing resulting from a tracheal or bronchial lesion is very difficult to overcome; in fact, no endobronchial treatment that I know of has been successful in re-establishing and maintaining the lumen after cicatricial stenosis has occurred. Temporary benefit may be secured but permanent relief is difficult. I am wondering whether it is wise to disturb a lung that is atelectatic. I am of the opinion that probably it had better be left alone.

Question: Dr. Clerf will have another word.

Answer: In connection with this problem I should like to cite the case of a young lady who had a cicatricial stenosis of the left main bronchus. I treated her for a time and managed to give temporary relief. She then went to a sanatorium and was lost sight of for about six months. She returned with a septic type of temperature, weight loss and considerable sputum. Bronchoscopic examination revealed that the lumen of the stenosed bronchus was not more than 2 mm. in diameter. I thought it utterly useless to do anything more bronchoscopically and recommended pneumonectomy. Dr. Bradshaw removed the left lung and the patient is doing very nicely eight months following operation.

Question: Would bronchoscopy be of value

in re-expanding a lower lobe previously undiseased but atelectatic after six months and uncomplicated pneumothorax?

Answer: I have had but one experience in trying to re-expand an atelectatic lobe of a lung, which was, of course, unassociated with bronchial obstruction or with any demonstrable lesion which would interfere with re-expansion. An esophagoscope with a section of rubber tubing over its distal end was introduced into the lobar bronchus producing an airtight fit. A window plug was inserted in the other end. We increased the pressure and observed the lung fluoroscopically. Nothing happened. The patient survived the procedure but the lung failed to re-expand. I believe it would be a hazardous procedure to use pressure endobronchially to re-expand lungs. It might be safer to use the old water bottle plan and blow water from one bottle to another.

To: Dr. Joseph W. Post.

Question: Can you give a brief discussion of the merits of the Rapid X-ray Examination Technic in Mass Surveys?

Answer: In the short space of time allotted to me for the answer to this question, I must necessarily touch only the highlights. We will, therefore, not discuss in any way the use of the conventional cellulose 14x17 film nor the fluoroscopic examination.

This narrows us down to the 4x5 and 35 mm. photofluoroscopic survey and the x-ray paper film survey, as made by the Powers Company.

The 4x5 type requires an expensive equipment costing about \$9000, and there has been considerable difficulty encountered in securing satisfactory lenses for the camera to produce them. These lenses weigh about 26 to 28 pounds and originally came from Czechoslovakia. Bausch and Lomb have attempted to produce a substitute lens, but at their best (the wide focus of) these lenses leave an *unsharp* area of about one-half inch around the entire edge and more so at the corners that interferes with sharp photographic detail. This, naturally, causes a sacrifice in those areas where early lesions are prone to occur. The method requires large numbers of (two) film holders which must necessarily be loaded and re-loaded. (They cannot be interpreted unless dry.) The rate of examination compares favorably with the others

and they lend themselves admirably to filing large numbers in a small space. The cost of the 4x5 film and chemicals is estimated at about six cents per exposure.

The 35 mm. method survey uses an equipment which costs about \$5000 and can also compete, with the speed of operation, with any other method. The company marketing them has recently developed a stereoscopic method of securing films and it is made possible to enlarge them and be viewed by a number of persons by means of the polarized stereoscope. The single film can either be viewed in a small magnifying viewing apparatus or they can be projected and enlarged, either on a screen or upon opal glass. The last method makes a very desirable method of viewing the films.

This method does not require the use of a fully-equipped darkroom and the cost of materials only is estimated at about fifty-two cents for 60, or less than one cent per exposure.

This method cannot be utilized except with a dried film.

The x-ray paper film service, as (used) provided by the Powers Company, costs about seventy-five cents per exposure for the completed radiograph and can be operated as rapidly as the other two methods. It serves to give a full size 14x17 exposure, and by using the individual cut—14x17—for each case, it is possible to rapidly develop them in the same place at which the examination is made, and they can be viewed and interpreted while wet within fifteen minutes after exposure. As a matter of fact, interpretation of these paper films while wet, compares, in my opinion, to that of the conventional cellulose 14x17 film. I make that statement from a personal experience of viewing and interpreting hundreds of these films at the Medical Advisory Board for the Selective Service applicants at Philadelphia, Pa.

This rapid examination and wet interpretation readily permits us, as no other method does, to give a satisfactory final report before the applicant is examined by the chest specialist. This gives the paper film a superiority which, in my opinion, makes it the most satisfactory and rapid method, for this type of survey. They can either be filed as is, or as a reduced copy.

Chairman: Thank you. Meeting Adjourned.

ORGANIZATION NEWS

CUBAN CHAPTER ELECTS NEW OFFICERS

The Cuban Chapter of the American College of Chest Physicians met at Havana, Cuba, June 26 and the following officers were elected: Dr. Alfredo Antonetti, President; Dr. Francisco J. Menendez, Vice-President; Dr. R. Sanchez Acosta, Secretary-Treasurer. Dr. Antonio Navarrete, Havana, Regent of the College, gave a report on the Eighth Annual Meeting of the American College of Chest Physicians which he attended at Atlantic City, New Jersey, June 6-8, 1942.

DR. WM. ATMAR SMITH ELECTED PRESIDENT

Dr. Wm. Atmar Smith, Charleston, South Carolina, a Fellow of the College and formerly Governor of the College for the state of South Carolina, is the incoming President of the Medical Society of South Carolina.

DR. REDFEARN ELECTED PRESIDENT

Dr. James A. Redfearn, Albany, Georgia, Governor of the College for that state, was inducted into office as President of the Georgia State Medical Society.

BOOK REVIEWS

THE HEART IN PREGNANCY AND THE CHILD-BEARING AGE. By Hamilton and Thompson. Cloth. Pub. 1941, by Little, Brown and Co. 402 pp. Price \$5.00.

Although there are several books available at this time which cover this subject, this book fills a distinct place because of the amount of well studied material presented and the manner of presentation. It is divided into three books, the first dealing with "The Cardiac in Pregnancy," the second with "Physiology of the Circulation in Normal Pregnancy and in Pregnant Women with Heart Disease" and the third with "The Heart Diseases in Pregnancy and the Childbearing Age." Their subject matter and discussions are based upon actual experience in the classification, observations and treatment of several hundred pregnant cardiacs. Unfortunately they have chosen to use a classification not in wide use and perhaps confusing, as their group 1 is the most serious and their

group 3 the least, while the more widely used New York classification has a reversal use, Class 1 being the least serious and Class 4 the most aggravated case.

They present the customary statistical studies and criteria. This is followed by a very complete review of circulatory changes associated with pregnancy in both the normal and the cardiac patient. The final book deals with the various types of heart disease that may be present in this age group and cites their experience with each type. There is also a short section dealing with the proper method of obstetrical control and after care written by Frederick C. Irving.

It is the reviewer's opinion that this book is of value, not only to the general practitioner and obstetrician but also to the cardiologist. It clarifies many circulatory problems and presents common sense methods of diagnosing, classifying and treating these patients.

Homer P. Rush, M.D.

NEUROANATOMY. Fred A. Mettler, A.M., M.D., Ph.D. C. V. Mosby, St. Louis, 1941. Price \$6.50.

This exceptionally well-written text has succeeded in drawing attention to those general anatomic relationships and concepts which form the basis for the manipulations of practical medicine. Its value is enhanced by the deletion of nebulous views and the almost total incorporation of well illustrated available information. This present work is divided into two parts, the first of which deals with the topography and morphology of the central nervous system as seen with the naked eye. The second part is the microscopic section and concerns itself with the establishment of a sound and usable functional viewpoint. The illustrations show that considerable effort has been applied. Their clarity and method of design are somewhat unique and on casual observation, it is very apparent that they form one of the attractive features of this text. Paramount is the fact that the subject matter is presented in a manner which makes its use imperative in all branches of medicine. There is very little doubt but that this book will become a popular standard text and it is without doubt, a valuable contribution to medical literature.

Maurice F. Snitman, M.D.